

CONSTRAINT PROGRAMMING APPLICATIONS IN SUPPLY CHAIN SCHEDULING PROBLEMS

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ABSTRACT

The characteristic feature of supply chain scheduling is that the constituents of a supply chain need to cooperate, rather than compete, in order to achieve maximum benefits. Today's supply chains differ from the integrated logistics systems of the past primarily because of the autonomous nature of its constituents. In the traditional approach to integrated logistics, the entire system is treated as a monolithic entity, whereas today's supply chains are usually comprised of components that are autonomous entities with competing interests. These constituents of the supply chain, such as manufacturers, wholesalers, and retailers, will be better off if they operate in co-operation. Similar situation arises in supply contracts. Co-operation via supply contracts results in a win-win outcome for all parties concerned. The same is true for supply chain scheduling, which is concerned with timing and amount of material handling moves throughout the supply chain. Supply chain scheduling has replaced the integrated production planning and scheduling systems of traditional logistics; and cooperation is essential in scheduling operations in supply chains.

The traditional modeling and computational paradigm for integrated production planning and scheduling systems has been mathematical programming. However, there have been incredible computational improvements observed when mathematical programming approaches are integrated with constraint programming. Constraint programming is an approach for solving computationally complex problems. This logic-based modeling approach is especially effective for large-scale problems with side conditions, as is the case in supply chain scheduling problems. In this presentation modeling and solution approaches of mathematical programming and logic-based methods are briefly compared and contrasted using examples from scheduling and supply chain operations. An overview of the current state of research in this field will be presented.